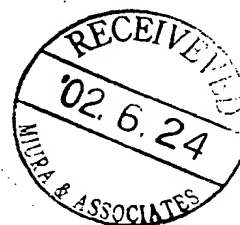




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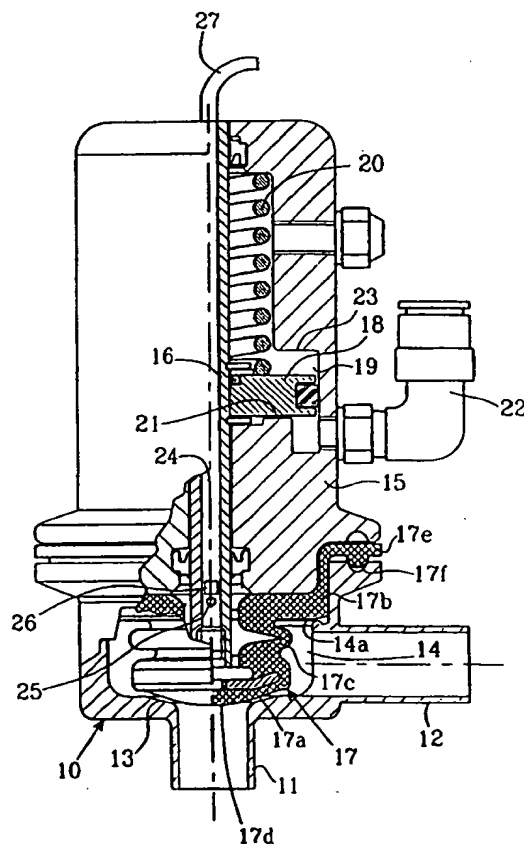
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(54) Title: A VALVE DEVICE

## (57) Abstract

A valve device in a fluid system comprising a valve housing (10) provided with an inlet opening (11) and at least one outlet opening (12) and a valve seat (13) in connection to said inlet opening. The device further comprises a valve rod (16) which by means of actuating means (18, 22) is displaceable towards and away from the valve seat (13) and a diaphragm (17) of a flexible material which is actuatable by the valve rod and acts as a sealing against the valve seat (13). In order to indicate the presence of leakage through the diaphragm (17) without leaking to the environment and/or to make it possible to apply a counter pressure on the inside of the diaphragm in order to prevent collapse thereof at high process pressures the valve rod (16) is hollow and at or close to its end facing the diaphragm (17) is provided with a hole (25) through which the inner hollow space (24) of the valve rod communicates with the inside of the diaphragm.



引用例  
Your Ref: F9104EP  
for Ref: Fujikura - EP-09-14

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## A VALVE DEVICE

### Technical field

5 The present invention refers to a valve device comprising a valve housing provided with an inlet opening and at least one outlet opening and a valve seat in connection to said inlet opening, and further comprising a valve body including a valve rod which by means of actuating means is displaceable towards and away from the valve seat and a diaphragm of a flexible material which is actuatable by the valve rod and acts as a sealing against the  
10 valve seat, said diaphragm by means of said actuating means and said valve rod is moveable between open and closed position with respect to said valve seat.

### Background of the invention

15 Valve devices of this kind are shown in e g SE-B-445 852 and EP-B-0 508 658. Such valve devices are at first hand intended to act as stop valves or flow regulation valves in fluid systems having high demands on hygiene and where sterilization in autoclaves normally is a requirement. They can be used as outlet valves in tanks as well as valves in tube systems.

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In order to indicate leakage in the valve, e g caused by fractures in the diaphragm there is a drainage hole which communicates with the inside of the membrane and extends through the valve housing to the environment. The leakage runs in this case right out to the environment, which is undesirable in the case of handling toxic or expensive substances.

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Another problem in these valves is that there is a certain risk that the diaphragm sealing against the valve seat can collapse at high process pressures, at which the valve opens unintentionally.

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Object and most important features of the invention

The object of the present invention is to provide a valve device of the kind mentioned above with which a leakage indication can be provided without waste to the environment and/or in which a counter pressure can be applied to the inside of the diaphragm in order to prevent this from collapsing at high process pressures.

This has been provided by the fact that the valve rod is hollow and at or close to its end facing the diaphragm is provided with a hole through which the inner hollow space of the valve rod communicates with the inside of the diaphragm, at which the diaphragm covers the hole and prevents fluid from penetrating into the inner hollow space of the valve rod.

Description of the drawing

The invention will below be closer described with reference to an embodiment shown in the accompanying drawing.

The drawing shows the valve device according to the invention partly in section.

Description of an embodiment

The valve device according to the invention comprises a valve housing 10 provided with an inlet opening 11 and an outlet opening 12. There may possibly be two or more outlet openings. In connection to the inlet opening 11 there is arranged a ring-shaped valve seat 13. The valve housing 10 is further provided with an opening 14 opposite the inlet opening 11.

The valve further comprises a valve rod housing 15 connected to the valve housing 10 and in which a valve rod 16 is received, said valve rod is axially displaceable in the valve rod housing 15 and the valve housing 10 connected thereto in a direction towards and away from the valve seat 11. A flexible diaphragm 17, e g by silicone rubber, forming the valve body is mounted to the valve rod.

The diaphragm 17 is mounted on the valve rod 16 and is actuateable by this and is provided with a portion 17a which is moveable to sealing contact with and away from the valve seat 13. The diaphragm 17 is provided with a second portion 17b sealing against the opening 14 in the valve housing. A downwardly directed lip 14a in connection to said opening 14 ensures the sealing function. The portions 17a and 17b of the diaphragm are interconnected by means of a bellows-shaped bulged portion 17c, which when the diaphragm moves from closed to open position will bulge outwards to a greater extent. The end surface 17d of the diaphragm 17 facing the inlet opening 11 is in the shown embodiment somewhat convex in order to simplify a complete drainage when the diaphragm moves to open position. The surface 17d can alternatively be substantially planar. The diaphragm 17 forms as seen from the fluid side a flat autoclaveable surface.

The diaphragm is with its end portion 17e facing away from said end surface 17d clamped between the valve housing 10 and the valve rod housing 15 and is provided with a bulged portion 17f forming a sealing between said housing portions.

A piston 18 is attached about the valve rod 16 at the central portion thereof, said piston is received in a cylindrical space 19 in the valve rod housing 15. A spring 20 acts upon the piston 18 for pressing this against a first end stop 21 in said cylindrical space 19. In said position the diaphragm 17 is pressed to sealing contact with the valve seat 13. By means of a pressure fluid connection 22 a pressure fluid, e.g. pressurized air, can be supplied to the pressure side of the piston 18 and force this against the action of the spring 20 to be pressed in the direction upwards as seen in the drawing towards a second end stop 23, at which the diaphragm 17 is brought from sealing position and opens the valve so that fluid in this position can pass in through the inlet opening 11. A device e.g. a signal pin (not shown) which can be visually inspected from the outside of the valve can be connected to the piston 18 for indicating the position of the piston and by that the position of the valve.

In stead of the pressure fluid actuated adjustment of the valve shown in the drawing this adjustment can be made by making the valve rod 16 axially displaceable by rotating a grip handle. Such a screw operated valve rod is e.g. shown in SE-B-445 852.

The valve rod 16 is hollow and thus is provided with an inner hollow space 24. A hole 25 is arranged in the valve rod close to its end facing the diaphragm 17, at which the inner hollow space 24 of the valve rod communicates with the inside of the diaphragm 17 through said hole 25. This construction can fulfil two different functions.

Firstly it can have a leakage-indicating function at which a sensor 26 intended to detect the presence of a fluid is arranged in the hollow space 24 close to the hole 25. The sensor 26 may of course be arranged anywhere in the hollow space 24 or be placed outside the valve rod 16 in communication with the hollow space 24.

The most common cause to leakage is fractures in the diaphragm 17 and the most sensitive part is the bulged bellows-shaped portion 17c. In previously known valves of this kind leakage indication has been made by means of a drainage hole communicating with the inside of the membrane and extending through the valve- or valve rod housing to the environment. The waste in this case flows directly to the environment, which is not desired especially when handling toxic or expensive substances. With the new construction according to the invention such waste to the environment is avoided.

The second function of the hollow valve rod 16 is the possibility to via a connection 27 supply a pressure fluid, e.g. pressurized air, to the hollow space 24 at which a supporting pressure is obtained in the valve rod on the backside of the diaphragm 17. This can be desired when operating with high process pressures when the membrane in other case can collapse by the high pressure, at which leakage through the valve can occur. With a suitable support pressure within the valve rod such a collapse of the membrane can be avoided.

These two functions can preferably be present in one and the same valve. It is however possible that in certain cases only one of these two functions are needed.

The invention is thus not limited to the shown embodiment but a number of modifications are possible within the scope of the following claims.

## CLAIMS

1. A valve device in a fluid system comprising a valve housing (10) provided with an inlet opening (11) and at least one outlet opening (12) and a valve seat (13) in  
5 connection to said inlet opening, and further comprising a valve rod (16) which by means of actuating means (18,22) is displaceable towards and away from the valve seat (13) and a diaphragm (17) of a flexible material which is actuatable by the valve rod and acts as a sealing against the valve seat (13), said diaphragm by means of said actuating means (18,22) and said valve rod (16) is moveable between open and closed  
10 position with respect to said valve seat (13),

characterized in

that the valve rod (16) is hollow and at or close to its end facing the diaphragm (17) is provided with a hole (25) through which the inner hollow space (24) of the valve rod communicates with the inside of the diaphragm, at which the diaphragm covers the hole  
15 (25) and prevents fluid from penetrating into the inner hollow space (24) of the valve rod.

2. A valve device as claimed in claim 1,

characterized in

20 that in or in connection to said hollow space (24) there is arranged a sensor (26) intended to detect the presence of a fluid.

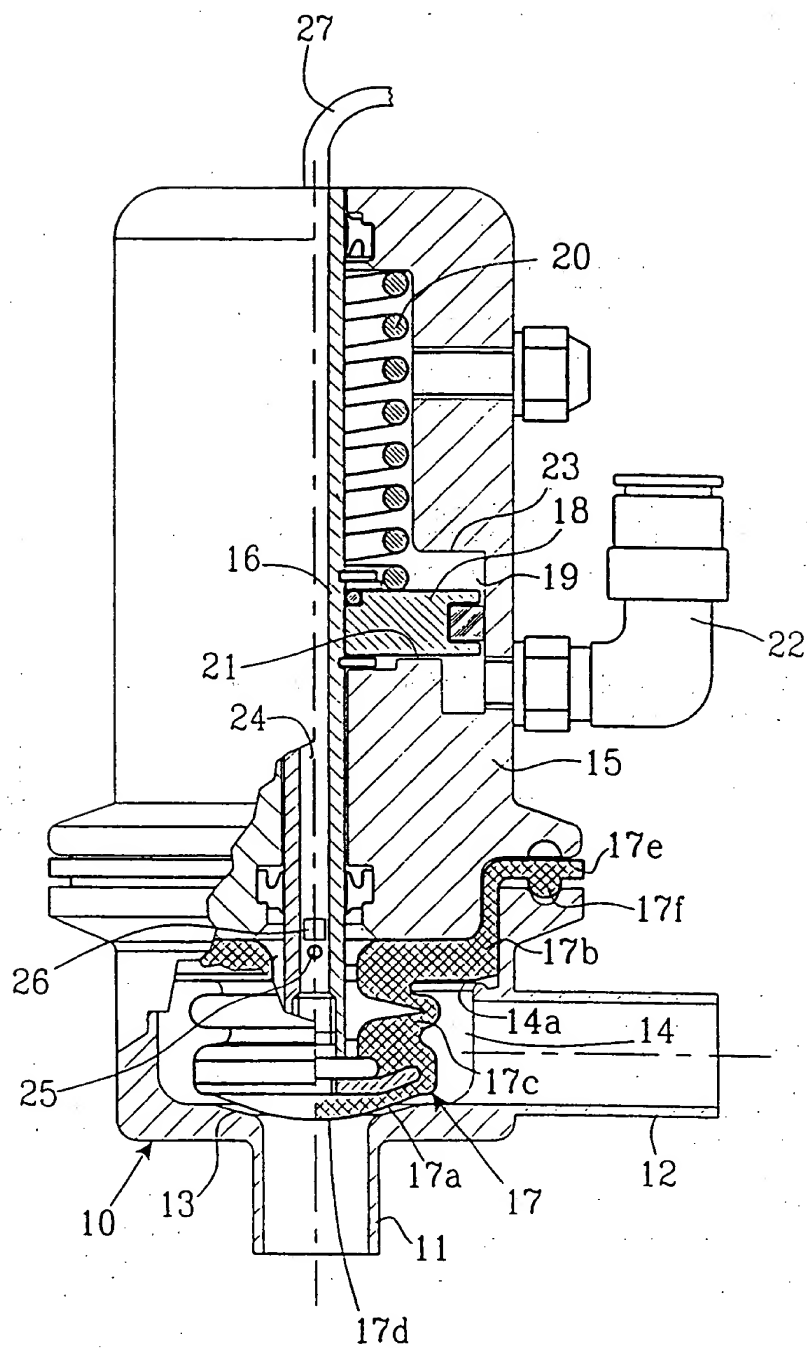
3. A valve device as claimed in claim 1,

characterized in

25 that connection means (27) are provided for supplying pressure fluid to said hollow space (24) for creating a support pressure within the valve rod (16) on the inside of the diaphragm (17).

1/1

FIG. 1





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/01013

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F16K 7/17

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F16K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9534761 A1 (TOUR & ANDERSSON HYDRONICS AB), 21 December 1995 (21.12.95), figure 1, claim 1	1-3
A	EP 0148480 A2 (COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS CIT-ALCATEL S.A.), 17 July 1985 (17.07.85), page 2, figures 1,2, abstract	1-3
A	EP 0508658 A2 (ASEPCO), 14 October 1992 (14.10.92), figure 2, abstract	1-3

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Further documents are listed in the continuation of Box C.

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**INTERNATIONAL SEARCH REPORT**  
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Patent document cited in search report	Publication date	Patent-family member(s)	Publication date
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